EXHIBIT B
CLAIM CONSTRUCTION OF TERMS IN DISPUTE

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

No.	Proposed Claim Terms / Patents	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
1a	antenna element '191 patent: 1 '918 patent: 1, 5, 23, 26 '768 patent: 1, 8, 9, 12, 16, 17, 23, 30, 31, 38 '870 patent: 1, 4, 11, 20, 29 '256 patent: 1, 6, 7, 11, 17 '493 patent: 1, 9, 11, 13, 14, 18 '940 patent: 8, 9, 11, 18	"individual antenna that makes up an array"	**Intrinsic Evidence:** 1:63-2:7, 2:16-19, 2:58-3:3, 3:7-10, 3:19-24, 3:40-43, 3:48-50, 3:54-55, 3:59-60, 4:2-7, 4:22-40, 4:64-5:7, 5:17-6:7, 6:25-34, 6:44-7:31, 7:43-8:10, 8:15-67, Figs. 1, 5, 7, 8, 9, 11, asserted claims using the terms "antenna element" and "element." **Extrinsic Evidence:** Constantine A. Balanis, Antenna Theory, Analysis and Design (1st. ed. 1982) at 1. Warren Stutzman and Gary Thiele, Antenna Theory and Design (1st. ed.1981) at 1.	"individual antenna that makes up an *antenna array* and that can independently radiate and receive electromagnetic waves"	'191 Patent, Col. 1:63-2:19, 2:31-54, 2:58-3:11, 3:18-23, 4:1-11, 5:1-15, 5:15-55, 6:24-34, 6:40-57, 7:25-30, 7:45-67, 8:1-10, 8:61-9:8, 9:56-65, Figs. 7-12 Fractus Nov. 2, 2004, EPO Response Letter Fractus Nov. 20, 2006, EPO Response Letter Fractus Aug. 8, 2008, EPO Written Submissions and Requested Amendments Fractus Oct. 31, 2008, EPO Letter re Minutes of Oral Proceeding Fractus Feb. 19, 2009, EPO Appeal Reasoning Fractus Oct. 11, 2012, EPO Letter re Amendments

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					'191 File History, 7/9/2004 Applicant Arguments/Remarks '918 File History, 5/31/2006 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks '870 File History, 11/2/2010 Applicant Arguments/Remarks '493 File History, 8/26/2013 Amendment Fractus v. Samsung, D.E. 475, 526, 900. THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 910, 911 (7th ed.: 2000) IEEE STANDARD DEFINITIONS OF TERMS FOR ANTENNAS at 4, 28-29 (1993) R.F. Graf, MODERN DICTIONARY OF

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					ELECTRONICS p. 614 (7th ed.: 1999) MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS p. 709, 1730 (6th ed.: 2003) C. Balanis, ANTENNA THEORY AND DESIGN p. 21-22, 249-250 (2d ed.: 1997) HARGRAVE'S COMMUNICATIONS DICTIONARY p. 23 (2001) U.S. Patent No. 6,937,206. Prosecution history for 95/000,586. Prosecution history for WO 01/31747 and EP1227545.
1b	element '191 patent: 1, 5 '256 patent: 17	"individual antenna that makes up an array"	**Intrinsic Evidence:** *See* Fractus's evidence for "antenna element." **Extrinsic Evidence:** Constantine A. Balanis, Antenna Theory,	"individual antenna that makes up an *antenna array* and that can independently radiate and receive electromagnetic waves"	'191 Patent, Col. 1:63-2:19, 2:31-54, 2:58-3:11, 3:18-23, 4:1-11, 5:1-15, 5:15-55, 6:24-34, 6:40-57, 7:25-30, 7:45-67, 8:1-10, 8:61-9:8, 9:56-65, Figs. 7-12

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			Analysis and Design (1st. ed. 1982) at 1. Warren Stutzman and Gary Thiele, Antenna Theory and Design (1st. ed.1981) at 1.		Fractus Nov. 2, 2004, EPO Response Letter Fractus Nov. 20, 2006, EPO Response Letter Fractus Aug. 8, 2008, EPO Written Submissions and Requested Amendments Fractus Oct. 31, 2008, EPO Letter re Minutes of Oral Proceeding Fractus Feb. 19, 2009, EPO Appeal Reasoning Fractus Oct. 11, 2012, EPO Letter re Amendments '191 File History, 7/9/2004 Applicant Arguments/Remarks '918 File History, 5/31/2006 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks '870 File History, 11/2/2010 Applicant Arguments/Remarks

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					'493 File History, 8/26/2013 Amendment Fractus v. Samsung, D.E. 475, 526, 900. THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 910, 911 (7th ed.: 2000) IEEE STANDARD DEFINITIONS OF TERMS FOR ANTENNAS at 4, 28-29 (1993) R.F. Graf, MODERN DICTIONARY OF ELECTRONICS p. 614 (7th ed.: 1999) MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS p. 709, 1730 (6th ed.: 2003) C. Balanis, ANTENNA THEORY AND DESIGN p. 21-22, 249-250 (2d ed.: 1997) HARGRAVE'S COMMUNICATIONS

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					DICTIONARY p. 23 (2001) U.S. Patent No. 6,937,206. Prosecution history for 95/000,586. Prosecution history for WO 01/31747 and EP1227545.
2a	Multiband antenna ‘191 patent: 1, 5	“an antenna element, which covers more than one frequency band, formed by portions coupled to each other electromagnetically which interact with each other in order to establish the radioelectric behavior of the antenna element, which with respect to radiation patterns and impedance is similar in multiple frequency bands”	**Intrinsic Evidence:** 1:8-18, 2:32-39, 2:58-3:10 asserted claims using the terms “multiband antenna” and “multiband antenna element.” ’768 Patent File History, Response (Oct. 20, 2008) ’870 Patent File History, Response (Nov. 2, 2010) ’493 Patent File History, Office Action (Mar. 23, 2013), Response (Aug. 26, 2013) C. Puente et al., “Antenas Fractales o Mulitfractales”; ES 9501019. C. Puente et al., “Unas antenas multitriangulares duales para telefonia	“*antenna element*, usable at more than one frequency band, formed by a set of elements coupled to each other electromagnetically which interact with each other in order to establish the radio-electric behavior of the antenna element, which with respect to radiation and impedance patterns is similar in multiple *frequency bands*.”	’191 Patent, Col. 1:8-12, 2:8-31, 2:31-54, 2:66-3, 2:8-31, 5:1-16, 5:16-45 Nov. 2, 2004, EPO Response Letter Fractus Nov. 20, 2006, EPO Response Letter Fractus Aug. 8, 2008, EPO Written Submissions and Requested Amendments Fractus Oct. 31, 2008, EPO Letter re Minutes of Oral Proceeding Fractus Feb. 19, 2009, EPO Appeal Reasoning Fractus Oct. 11, 2012, EPO Letter re Amendments

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			cellular GSM y DCS"; ES 9800954; PCT/ES99/00296		'191 File History, 7/9/2004 Applicant Arguments/Remarks '918 File History, 5/31/2006 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks '870 File History, 11/2/2010 Applicant Arguments/Remarks '493 File History, 8/26/2013 Amendment See evidence cited above regarding "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*."
2b	Multiband antenna element '918 patent: 1, 5 '768 patent: 1, 9, 16, 23, 30, 38 '870 patent: 1, 11, , 29 '256 patent: 1, 17	"an antenna element, which covers more than one frequency band, formed by portions coupled to each other electromagnetically which interact with each other in order to establish the radioelectric behavior of the antenna element, which with respect to	**Intrinsic Evidence:** *See* Fractus's evidence for "multiband antenna." C. Puente et al., "Antenas Fractales o Mulitfractales"; ES 9501019. C. Puente et al., "Unas antenas multitriangulares	"*antenna element*, usable at more than one frequency band, formed by a set of elements coupled to each other electromagnetically which interact with each other in order to establish the radio-electric behavior of the antenna element, which with	'191 Patent, Col. 1:8-12, 2:8-31, 2:31-54, 2:66-3, 2:8-31, 5:1-16, 5:16-45 Nov. 2, 2004, EPO Response Letter Fractus Nov. 20, 2006, EPO Response Letter

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		radiation patterns and impedance is similar in multiple frequency bands"	duales para telefonia cellular GSM y DCS"; ES 9800954; PCT/ES99/00296	respect to radiation and impedance patterns is similar in multiple *frequency bands*."	Fractus Aug. 8, 2008, EPO Written Submissions and Requested Amendments Fractus Oct. 31, 2008, EPO Letter re Minutes of Oral Proceeding Fractus Feb. 19, 2009, EPO Appeal Reasoning Fractus Oct. 11, 2012, EPO Letter re Amendments '191 File History, 7/9/2004 Applicant Arguments/Remarks '918 File History, 5/31/2006 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks '870 File History, 11/2/2010 Applicant Arguments/Remarks '493 File History, 8/26/2013 Amendment See evidence cited above regarding "*antenna element*," "*mono-band*

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					antenna arrays," and "*frequency band*."
3	Multiband antenna array '191 patent: 1, 5 '918 patent: 1, 5 '768 patent: 1, 9, 16, 23, 30, 38 '870 patent: 1, 2, 11, 20 '256 patent: 1, 17	"Multiband antenna array" by itself is not limiting. To the extent it is limiting and a construction is necessary, it should be afforded its plain and ordinary meaning of an "array that covers more than one frequency band."	**Intrinsic Evidence:** Abstract, 1:8-27, 2:55-60, 5:10-16, 5:46-53 asserted claims using the term "multiband antenna array."	"*antenna array* that is useable at more than one frequency band"	'191 Patent, Col. 8:1-10, 8:61-9:8, 9:56-65, 3:1-2, 7:25-30, 7:45-67, 8:30-50, 2:32-55, 2:57-3:10, 3:64-67, 4:1-8, 5:1-15, 5:15-55, 1:8-12, 2:58-3:10 7:43-67, Figs. 7-12 '191 File History, 7/9/2004 Applicant Arguments/Remarks See evidence cited regarding "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*."
4	Interlaced multiband antenna array '191 patent: 1 '918 patent: 1 '768 patent: 1, 9, 16, 23, 30, 38 '870 patent: 1, 11, 20	This term is not limiting. To the extent it is limiting and a construction is necessary, it should be construed as "an array of antennas capable of working simultaneously in various frequency bands achieved by using multiband antennas in strategic positions where	**Intrinsic Evidence:** Abstract, 1:8-27, 2:55-3:10, 5:10-16, 5:46-53, 5:62-6:7, 6:24-57, 6:66-7:25, 8:29-50, Figs. 5-10 asserted claims using the term "interlaced multiband antenna array."	"a *multiband antenna array*, in which *monoband antenna elements* useable at one frequency band are interleaved with monoband antenna elements useable at another frequency band"	'191 Patent, Abstract '191 Patent, Col. 1:1-27, 2:58-3:10, 4:20-33, Figs. 1-5, 7:43-67, 8:15-20, 8:29-50, 4:20-21, 4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 6:20-57, 7:1-27, 7:46-8-2, 8:29-50, 10:20-25, Figs. 1-9 and 11-12

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	’256 patent: 1, 17 ’493 patent: 1, 11, 18	the disposition of the elements of the array is obtained from the juxtaposition of conventional monoband arrays.”			Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002) See evidence cited above regarding “*antenna element*,” “*mono-band antenna arrays*,” and “*frequency band*.” In addition, the following evidence is cited: THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 577 (7th ed.: 2000) THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 543-544 (6th ed.: 1993) R.F. Graf, MODERN DICTIONARY OF ELECTRONICS p. 386, 387 (7th ed.: 1999) MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND

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					TECHNICAL TERMS p. 1095 (6th ed.: 2003) HARGRAVE'S COMMUNICATIONS DICTIONARY p. 268 (2001) Prosecution history for WO 01/31747 and EP1227545 U.S. Patent No. 6,937,206
5a	a wavelength of the [first/second] continuous frequency range '493 patent: 1, 9, 11	No construction is necessary.	**Intrinsic Evidence:** 2:2-7, 7:45-49 Asserted claims using the terms "a [operating] wavelength [of a] frequency" **Extrinsic Evidence:** Dr. Stuart Long's expert declaration in support of Fractus's claim constructions.	Indefinite	'191 Patent, Col. 1:56-2:7, 4:21-34, 6:66-25, 7:42-67, 8:29-60
5b	an operating wavelength of the first frequency range '493 patent: 11	No construction is necessary.	**Intrinsic Evidence:** *See* Fractus's evidence for "a wavelength of the [first/second] continuous frequency range." **Extrinsic Evidence:** *See* Fractus's evidence for "a wavelength of the	Indefinite	'191 Patent, Col. 1:56-2:7, 4:21-34, 6:66-25, 7:42-67, 8:29-60

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			[first/second] continuous frequency range."		
5c	an operating wavelength of the second contiguous frequency range '493 patent: 11	No construction is necessary.	**Intrinsic Evidence:** *See* Fractus's evidence for "a wavelength of the [first/second] continuous frequency range." **Extrinsic Evidence:** *See* Fractus's evidence for "a wavelength of the [first/second] continuous frequency range."	Indefinite	'191 Patent, Col. 1:56-2:7, 4:21-34, 6:66-25, 7:42-67, 8:29-60
5d	wavelength of a [first/second] frequency band '940 patent: 8	No construction is necessary.	**Intrinsic Evidence:** *See* Fractus's evidence for "a wavelength of the [first/second] continuous frequency range." **Extrinsic Evidence:** *See* Fractus's evidence for "a wavelength of the [first/second] continuous frequency range."	Indefinite	'191 Patent, Col. 1:56-2:7, 4:21-34, 6:66-25, 7:42-67, 8:29-60
5e	operating wavelength of the [first/second] frequency band '940 patent: 8	No construction is necessary.	**Intrinsic Evidence:** *See* Fractus's evidence for "a wavelength of the [first/second] continuous frequency range." **Extrinsic Evidence:** *See* Fractus's evidence for "a wavelength of the	Indefinite	'191 Patent, Col. 1:56-2:7, 4:21-34, 6:66-25, 7:42-67, 8:29-60

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			[first/second] continuous frequency range."		
5f	a ratio between a working frequency of the third frequency band and a working frequency of the second frequency band is around 2.33/2 '493 patent: 18	No construction is necessary after "frequency band" is construed. If construction is needed, this term should be afforded its plain and ordinary meaning, "a ratio between a working frequency of the third [frequency band] and a working frequency of the second [frequency band] is approximately 2.33/2."	**Intrinsic Evidence:** 1:16-19, 1:63-2:7, 2:48-3:10, 3:18-34, 3:48-67, 4:20-29, 4:64-66, 5:15-27, 5:54-6:7, 6:16-7:25, 7:43-67, 7:56-57, 8:15-50, 10:10-19, Figs. 2, 7 & 8 **Extrinsic Evidence:** Dr. Stuart Long's expert declaration in support of Fractus's claim constructions.	Indefinite	'191 Patent, Col. 1:56-2:7, 4:21-34, 6:66-25, 7:42-67, 8:29-60
6a	Juxtaposition '918 patent: 1 '870 patent: 29	"overlapping [a plurality of mono-band antenna arrays] to determine the position where antenna elements in the mono-band antenna arrays coincide (including after repositioning elements in low-frequency mono-band array[s] to the positions of elements in the highest-frequency array)"	**Intrinsic Evidence:** Abstract, 1:8-27, 2:55-3:10, 5:10-16, 5:46-53, 5:62-6:7, 6:24-57, 6:66-7:25, 8:29-50, Figs. 5-10 asserted claims using the term "interlaced multiband antenna array." **Extrinsic Evidence:** Random House Unabridged Dictionary (1993) (definition of juxtaposition)	The term does not need to be construed separately and should be construed as part of the larger phrases discussed below.	'191 Patent, Abstract, Col. 1:11-19, 8:29-50, 4:20-21, 4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 5:41-6:7, 6:20-57, 7:1-27, 7:46-8-2, 8:29-50, 10:20-25, Figs. 1-9, 11-12 Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002)

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			The International Webster's Compact Dictionary of the English Language (1999) (definition of juxtapose) The Oxford American Dictionary and Language Guide (1999) (definition of juxtapose)		'191 Patent, File History, Applicants' July 9, 2004 response to Office Action See evidence cited above regarding "*interlaced*," "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*." U.S. Patent No. 6,937,206.
6b	juxtaposition of a plurality of mono-band antenna arrays '918 patent: 1 '768 patent: 1, 9, 16, 23, 30, 38 '870 patent: 1, 11, 20	"overlapping a plurality of mono-band antenna arrays to determine the position where antenna elements in the mono-band antenna arrays coincide (including after repositioning elements in low-frequency mono-band array[s] to the positions of elements in the highest-frequency array)"	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition."	"interleaving the *antenna elements* of a plurality of *mono-band antenna arrays* while maintaining the spacing between the *antenna elements* within each *mono-band array*"	'191 Patent, Abstract, Col. 1:11-19, 8:29-50, 4:20-21, 4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 5:41-6:7, 6:20-57, 7:1-27, 7:46-8-2, 8:29-50, 10:20-25, Figs. 1-9, 11-12 Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002) '191 Patent, File History, Applicants' July 9, 2004 response to Office Action

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					See evidence cited above regarding "*interlaced*," "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*." U.S. Patent No. 6,937,206.
6c	juxtaposition of a plurality of mono-band arrays '191 patent: 1, 5	"overlapping a plurality of mono-band antenna arrays to determine the position where antenna elements in the mono-band antenna arrays coincide (including after repositioning elements in low-frequency mono-band array[s] to the positions of elements in the highest-frequency array)"	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition."	"interleaving the *antenna elements* of a plurality of *mono-band antenna arrays* while maintaining the spacing between the *antenna elements* within each *mono-band array*"	'191 Patent, Abstract, Col. 1:11-19, 8:29-50, 4:20-21, 4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 5:41-6:7, 6:20-57, 7:1-27, 7:46-8-2, 8:29-50, 10:20-25, Figs. 1-9, 11-12 Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002) '191 Patent, File History, Applicants' July 9, 2004 response to Office Action See evidence cited above regarding "*interlaced*," "*antenna element*,"

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					"*mono-band antenna arrays*," and "*frequency band*." U.S. Patent No. 6,937,206.
6d	juxtaposition of at least a first antenna array operating in a first frequency band, and a second antenna array operating in a second frequency band '256 patent: 1, 17	"overlapping at least a first antenna array operating in a first frequency band, and a second antenna array operating in a second frequency band to determine the position where antenna elements in the mono-band antenna arrays coincide (including after repositioning elements in low-frequency mono-band array[s] to the positions of elements in the highest-frequency array)"	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition."	"interleaving *the antenna elements* of a first *antenna array* operating in a first *frequency band* and the *antenna elements* of a second *antenna array* operating in a second *frequency band* while maintaining the spacing between the *antenna elements* within the first *antenna array* and the *antenna elements* within the *second antenna array*"	'191 Patent, Abstract, Col. 1:11-19, 8:29-50, 4:20-21, 4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 5:41-6:7, 6:20-57, 7:1-27, 7:46-8-2, 8:29-50, 10:20-25, Figs. 1-9, 11-12 Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002) '191 Patent, File History, Applicants' July 9, 2004 response to Office Action See evidence cited above regarding "*interlaced*," "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*."

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					U.S. Patent No. 6,937,206.
6e	positions of the plurality of antenna elements result from juxtaposition of a plurality of mono-band antenna arrays '918 patent: 1 '768 patent: 1, 9, 16, 23, 30, 38 '870 patent: 1, 11, 20	"positions of the plurality of antenna elements result from overlapping a plurality of mono-band antenna arrays to determine the position where antenna elements in the mono-band antenna arrays coincide (including after repositioning elements in low-frequency mono-band array[s] to the positions of elements in the highest-frequency array)"	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of Fractus's claim constructions.	"positions of the plurality of *antenna elements* in the *interlaced multiband antenna array* result from the step of interleaving the *antenna elements* of the plurality of *mono-band antenna arrays* while maintaining the spacing between the *antenna elements* within each *mono-band array*" (this is a product-by-process limitation)	'191 Patent, Abstract, Col. 1:11-19, 8:29-50, 4:20-21, 4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 5:41-6:7, 6:20-57, 7:1-27, 7:46-8-2, 8:29-50, 10:20-25, Figs. 1-9, 11-12 Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002) '191 Patent, File History, Applicants' July 9, 2004 response to Office Action See evidence cited above regarding "*interlaced*," "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*." U.S. Patent No. 6,937,206.
6f	the position of the elements in the array	"the position of the elements in the array	**Intrinsic Evidence:**	"positions of the *antenna elements* in the *interlaced*	'191 Patent, Abstract, Col. 1:11-19, 8:29-50, 4:20-21,

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	results from the juxtaposition of a plurality of mono-band arrays '191 patent: 1, 5	results from overlapping a plurality of mono-band antenna arrays to determine the position where antenna elements in the mono-band antenna arrays coincide (including after repositioning elements in low-frequency mono-band array[s] to the positions of elements in the highest-frequency array)"	*See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of Fractus's claim constructions.	*multiband antenna array* result from the step of interleaving the *antenna elements* of a plurality of *mono-band antenna arrays* while maintaining the spacing between the *antenna elements* with each *mono-band array*" (this is a product-by-process limitation)	4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 5:41-6:7, 6:20-57, 7:1-27, 7:46-8-2, 8:29-50, 10:20-25, Figs. 1-9, 11-12 Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002) '191 Patent, File History, Applicants' July 9, 2004 response to Office Action See evidence cited above regarding "*interlaced*," "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*." U.S. Patent No. 6,937,206.
6g	positions of the plurality of antenna elements result from juxtaposition of at least a first antenna array operating in a first frequency band, and a	"positions of the plurality of antenna elements result from overlapping at least a first antenna array operating in a first frequency band, and a	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition" and "frequency band" with respect to the Multiband	"positions of *the antenna elements* in the *interlaced multiband antenna array* result from the step of interleaving the *antenna elements* of a first	'191 Patent, Abstract, Col. 1:11-19, 8:29-50, 4:20-21, 4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 5:41-6:7, 6:20-57, 7:1-27, 7:46-8-2, 8:29-

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	second antenna array operating in a second frequency band, and a third antenna array operating in a third frequency band '256 patent: 17	second antenna array operating in a second frequency band, and a third antenna array operating in a third frequency band, to determine the position where antenna elements in the antenna arrays coincide (including after repositioning elements in low-frequency mono-band array[s] to the positions of elements in the highest-frequency array)"	Interlaced Antenna patent family. **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of Fractus's claim constructions.	*antenna array* operating only in a *first frequency band*, the *antenna elements* of a second *antenna array operating only in a second frequency band*, and the *antenna elements* of a third *antenna array* operating only in a *third frequency band* while maintaining the spacing between the *antenna elements* within the first *antenna array*, the second *antenna array*, and the third *antenna array*" (this is a product-by-process limitation)	50, 10:20-25, Figs. 1-9, 11-12 Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002) '191 Patent, File History, Applicants' July 9, 2004 response to Office Action See evidence cited above regarding "*interlaced*," "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*." U.S. Patent No. 6,937,206.
6h	positions of the plurality of dual-polarized antenna elements result from juxtaposition of a plurality of dual-polarized mono-band antenna arrays '870 patent: 29	"positions of the plurality of dual-polarized antenna elements result from overlapping a plurality of dual-polarized mono-band antenna arrays to determine the position where antenna elements in the antenna arrays coincide (including after	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of	"positions of the dual-polarized *antenna elements* in the *interlaced multiband antenna array* result from the step of interleaving the dual-polarized *antenna elements* of the plurality of dual polarized *mono-band antenna arrays* while maintaining the	'191 Patent, Abstract, Col. 1:11-19, 8:29-50, 4:20-21, 4:29-34, 2:62-66, 1:11-25, 3:3-6, 4:29-34, 5:41-6:7, 5:30-41, 5:41-6:7, 6:20-57, 7:1-27, 7:46-8-2, 8:29-50, 10:20-25, Figs. 1-9, 11-12

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		repositioning elements in low-frequency mono-band array[s] to the positions of elements in the highest-frequency array)"	Fractus's claim constructions.	spacing between the dual-polarized *antenna elements* within in each dual-polarized *mono-band array*" (this is a product-by-process limitation)	Ser. No., 10/135,019, Original Application (4/23/2002) Ser. No., 10/135,019, Preliminary Amendment (4/23/2002) '191 Patent, File History, Applicants' July 9, 2004 response to Office Action See evidence cited above regarding "*interlaced*," "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*." U.S. Patent No. 6,937,206.
7a	multiband antenna array employing a single multiband antenna in those positions of the multiband antenna array in which the positions of two or more elements of the mono-band arrays come together '191 patent: 1	No construction is necessary after "multiband antenna element," "mono-band antenna elements," and "come together" are construed. If construction is needed, this term should be afforded its plain and ordinary meaning, "the multiband antenna array	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of Fractus's claim constructions.	"single *multiband antenna element* of the *multiband antenna array* replaces two or more elements of *the mono-band arrays* at those positions where the two or more elements of the *mono-band arrays* coincide in the same physical location"	'191 Patent, Col 2:58-3:10, 5:17-44, 5:46-53, 7:43-67 '191 File History, 7/9/2004 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks See evidence cited above regarding "*interlaced*,"

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		employing a single [multiband antenna element] in those positions where two or more [mono-band antenna elements] of mono-band antenna arrays [come together]."			"*antenna element*," "*multiband antenna element*," and "*frequency band*." Prosecution history for WO 01/31747 and EP1227545 WEBSTER'S THIRD NEW INT'L DICTIONARY p. 441 (1986) AMERICAN HERITAGE DICTIONARY p. 289 (2d ed. 1985)
7b	interlaced multiband antenna array employs a single multiband antenna element in positions wherein a plurality of antenna elements of the mono-band antenna arrays come together '918 patent: 1	No construction is necessary after "multiband antenna element," "mono-band antenna elements," and "come together" are construed. If construction is needed, this term should be afforded its plain and ordinary meaning, "the multiband antenna array employing a single [multiband antenna element] in those positions where two or	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of Fractus's claim constructions.	"single *multiband antenna element* of the *interlaced multiband antenna array* replaces two or more elements of *the mono-band arrays* at those positions where the two or more elements of the *mono-band arrays* coincide in the same physical location"	'191 Patent, Col 2:58-3:10, 5:17-44, 5:46-53, 7:43-67 '191 File History, 7/9/2004 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks See evidence cited above regarding "*interlaced*," "*antenna element*," "*multiband antenna element*," and "*frequency band*."

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		more [mono-band antenna elements] of mono-band antenna arrays [come together]."			Prosecution history for WO 01/31747 and EP1227545 WEBSTER'S THIRD NEW INT'L DICTIONARY p. 441 (1986) AMERICAN HERITAGE DICTIONARY p. 289 (2d ed. 1985)
7c	interlaced multiband antenna array employs a single multiband antenna element in positions where mono-band antenna elements of a plurality of the plurality of mono-band antenna arrays come together '768 patent: 1, 9, 16, 23, 30, 38 '870 patent: 1, 11, 20	No construction is necessary after "multiband antenna element," "mono-band antenna elements," and "come together" are construed. If construction is needed, this term should be afforded its plain and ordinary meaning, "the interlaced multiband antenna array employs a single [multiband antenna element] in positions where [mono-band antenna elements] of a plurality of the plurality	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of Fractus's claim constructions.	"single *multiband antenna element* of the *interlaced multiband antenna array* replaces two or more *mono-band antenna elements* at those positions where the two or more *mono-band antenna elements* coincide in the same physical location"	'191 Patent, Col 2:58-3:10, 5:17-44, 5:46-53, 7:43-67 '191 File History, 7/9/2004 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks See evidence cited above regarding "*interlaced*," "*antenna element*," "*multiband antenna element*," and "*frequency band*." Prosecution history for WO 01/31747 and EP1227545

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		of mono-band antenna arrays [come together]."			WEBSTER'S THIRD NEW INT'L DICTIONARY p. 441 (1986) AMERICAN HERITAGE DICTIONARY p. 289 (2d ed. 1985)
7d	interlaced multiband antenna array employs a single multiband antenna element in positions where said first-band antenna element and said second-band antenna element come together '256 patent: 1	No construction is necessary after "multiband antenna element," "antenna element," and "come together" are construed. If construction is needed, this term should be afforded its plain and ordinary meaning, "the interlaced multiband antenna array employs a single [multiband antenna element] in positions where said first-band [antenna element] and said second-band [antenna element] [come together]."	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of Fractus's claim constructions.	"single *multiband antenna element* of the *interlaced multiband antenna array* replaces said first-band *antenna element* and said second-band *antenna element* in those positions where said first-band *antenna element* and said second-band *antenna element* coincide in the same physical location"	'191 Patent, Col 2:58-3:10, 5:17-44, 5:46-53, 7:43-67 '191 File History, 7/9/2004 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks See evidence cited above regarding "*interlaced*," "*antenna element*," "*multiband antenna element*," and "*frequency band*." Prosecution history for WO 01/31747 and EP1227545 WEBSTER'S THIRD NEW INT'L

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					DICTIONARY p. 441 (1986) AMERICAN HERITAGE DICTIONARY p. 289 (2d ed. 1985)
7e	the interlaced multiband antenna array employs a single multiband antenna element in positions where at least two of said first-band antenna element, said second-band antenna element and said third-band antenna element come together '256 patent: 17	No construction is necessary after "multiband antenna element," "antenna element," and "come together" are construed. If construction is needed, this term should be afforded its plain and ordinary meaning, "the interlaced multiband antenna array employs a single [multiband antenna element] in positions where at least two of said first-band [antenna element], said second-band [antenna element] and said third-band [antenna element] [come together]."	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition." Dr. Long's expert declaration in support of Fractus's claim constructions.	"single *multiband antenna element* of the *interlaced multiband antenna array* replaces at least two of said first-band *antenna elements*, said second-band *antenna element* and said third-band *antenna element* in those positions where at least two of said first-band *antenna elements*, said second-band *antenna element* and said third-band *antenna element* coincide in the same physical location"	'191 Patent, Col 2:58-3:10, 5:17-44, 5:46-53, 7:43-67 '191 File History, 7/9/2004 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks See evidence cited above regarding "*interlaced*," "*antenna element*," "*multiband antenna element*," and "*frequency band*." Prosecution history for WO 01/31747 and EP1227545 WEBSTER'S THIRD NEW INT'L DICTIONARY p. 441 (1986)

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					AMERICAN HERITAGE DICTIONARY p. 289 (2d ed. 1985)
7f	the interlaced dual-polarized multiband antenna array employs a single dual-polarized multiband antenna element in positions where dual-polarized mono-band antenna elements of a plurality of the plurality of dual-polarized mono-band antenna arrays come together ’870 patent: 29	No construction is necessary for this term after construction of “multiband antenna element,” “antenna element,” and “come together.” If construction is needed, this term should be afforded its plain and ordinary meaning, “the interlaced dual-polarized multiband antenna array employs a single [multiband antenna element] in positions wherein a plurality of mono-band antenna arrays [come together].”	**Intrinsic Evidence:** *See* Fractus’s evidence for “juxtaposition.” **Extrinsic Evidence:** *See* Fractus’s evidence for “juxtaposition.” Dr. Long’s expert declaration in support of Fractus’s claim constructions.	“single dual-polarized *multiband antenna element* of the dual-polarized *interlaced multiband antenna array* replaces two or more dual-polarized *mono-band antenna elements* at those positions where the two or more dual-polarized *mono-band antenna elements* coincide in the same physical location”	’191 Patent, Col 2:58-3:10, 5:17-44, 5:46-53, 7:43-67 '191 File History, 7/9/2004 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks See evidence cited above regarding “*interlaced*,” “*antenna element*,” “*multiband antenna element*,” and “*frequency band*.” Prosecution history for WO 01/31747 and EP1227545 WEBSTER’S THIRD NEW INT’L DICTIONARY p. 441 (1986) AMERICAN HERITAGE DICTIONARY p. 289 (2d ed. 1985)

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7g	the interlaced multiband antenna array employs a single multiband antenna element in positions wherein a plurality of antenna elements of the mono-band antenna arrays come together ’918 patent: 1	No construction is necessary for this term after construction of “multiband antenna element,” “mono-band antenna element,” and “come together.” If construction is needed, this term should be afforded its plain and ordinary meaning, “the interlaced multiband antenna array employs a single [multiband antenna element] in positions wherein a plurality of mono-band antenna arrays [come together].”	**Intrinsic Evidence:** *See* Fractus’s evidence for “juxtaposition.” **Extrinsic Evidence:** *See* Fractus’s evidence for “juxtaposition.” Dr. Long’s expert declaration in support of Fractus’s claim constructions.	“single *interlaced multiband antenna element* of the *multiband antenna array* replaces two or more *elements* of the *mono-band arrays* at those positions where the two or more *elements* of the *mono-band arrays* coincide in the same physical location”	’191 Patent, Col 2:58-3:10, 5:17-44, 5:46-53, 7:43-67 '191 File History, 7/9/2004 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks See evidence cited above regarding “*interlaced*,” “*antenna element*,” “*multiband antenna element*,” and “*frequency band*.” Prosecution history for WO 01/31747 and EP1227545 WEBSTER’S THIRD NEW INT’L DICTIONARY p. 441 (1986) AMERICAN HERITAGE DICTIONARY p. 289 (2d ed. 1985)
8a	… substantially arranged along a first direction with respect to a longitudinal axis…	No construction is necessary. If construction is needed,	**Intrinsic Evidence:** 8:15-28, 9:8:22, Figs. 8 & 9.	Indefinite	’191 Patent, Col., 4:64-67, 5:20-24, 5:29-34, 6:66-7:19, 7:26-31, 8:15-28, Figs. 1-9

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	’493 patent: 1, 11, 18	this term should be afforded its plain and ordinary meaning.	**Extrinsic Evidence:** Dr. Stuart Long’s expert declaration in support of Fractus’s claim constructions.		U.S. Patent No. 5,434,580 to Raguenet '493 FH 8/26/2013 Applicant Arguments/Remarks '493 FH 12/12/2013 Applicant Arguments/Remarks
8b	…substantially arranged along a longitudinal direction… ’940 patent: 1, 8	No construction is necessary. If construction is needed, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** 8:15-28, 9:8:22, Figs. 8 & 9. **Extrinsic Evidence:** Dr. Stuart Long’s expert declaration in support of Fractus’s claim constructions.	Indefinite	’191 Patent, Col., 4:64-67, 5:20-24, 5:29-34, 6:66-7:19, 7:26-31, 8:15-28, Figs. 1-9 U.S. Patent No. 5,434,580 to Raguenet '493 FH 8/26/2013 Applicant Arguments/Remarks '493 FH 12/12/2013 Applicant Arguments/Remarks
9	Frequency band ’191 patent: 12, 14, 15 ’918 patent: 1, 5, 9, 12, 14, 15, 19, 24, 25	“a range of radio frequencies designated for a cellular service”	**Intrinsic Evidence:** Abstract, 1:13-18, 2:48-54, 3:30-38, 3:48-57, 3:64-67, 4:40-50, 5:17-27, 5:57-58, 5:65-6:65, 7:33-35, 7:51-62, 8:15-20, 8:33-46, 9:36-41, Figs. 2-5, 7, 8, 10	“range of frequencies extending between two limiting frequencies”	’191 Patent, Abstract, Col. 4:35-56, 7:32-41, 5:1-3, 4:35-56 Fractus v. ZTE, No. 2:17-cv-561, D.E. 71, 77, 85.

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	’768 patent: 1, 2, 3, 5, 6, 9, 13, 14, 16, 17, 18, 21, 23, 24, 25, 26, 27, 30, 31, 32, 33, 35, 36, 38, 39, 41, 42 ’870 patent: 1, 3, 5, 6, 7, 8, 9, 11, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 33, 34, 35, 36, 37 ’256 patent: 1, 13, 14, 15, 16, 17 ’493 patent: 6, 7, 18 ’940 patent: 8, 16, 17		’918 Patent File History, Office Action (Jan. 26, 2006), Response (May 31, 2006), Office Action (Aug. 24, 2006) ’768 Patent File History, Response (Oct. 20, 2008) ’870 Patent File History, Office Action (July 2, 2010), Response (Nov. 2, 2010) ’493 Patent File History, Office Action (Mar. 27, 2013), Response (Aug. 26, 2013) **Extrinsic Evidence:** CMAB 1–22 (CellMax Datasheets) GSM: Digital cellular telecommunications system (Phase 2+); Radio transmission and reception (GSM 5.05) (July 1996) 47 C.F.R. 24.229 Federal Communications Commission, “700 MHz Public Safety Spectrum” at		Fractus v. Samsung, D.E. 475, 526, 900. U.S. Patent No. 8,354,972 U.S. Patent No. 6,937,206 U.S. Patent No. 7,312,762 U.S. Patent No. 7,315,289 U.S. Patent No. 7,411,556 A. W. Rudge, K. Milne, A. D. Olver, and P. Knight (eds.), “Handbook of Antenna Design, Volumes 1 and 2,” London, Peter Peregrinus Ltd. p. 1548(1986). THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 458 (7th ed.: 2000) THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 431 (6th ed.: 1996) R.F. Graf, MODERN DICTIONARY OF ELECTRONICS p. 304 (7th ed.: 1999)

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			https://www.fcc.gov/700-mhz-public-safety-narrowband-spectrum Federal Communications Commission, "Wireless Communications Service (WCS)" at https://www.fcc.gov/wireless/bureau-divisions/mobility-division/wireless-communications-service-wcs#block-menu-block-4 Federal Communications Commission, "Broadband Radio Service & Education Broadband Service" at https://www.fcc.gov/wireless/bureau-divisions/broadband-division/broadband-radio-service-education-broadband-service FCC White Paper, The Mobile Broadband Spectrum Challenge: International Comparisons (2013)		MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS p. 854 (6th ed.: 2003) HARGRAVE'S COMMUNICATIONS DICTIONARY p. 221 (2001) NAMED INVENTOR PUBLICATIONS[1]

[1] *See* Appendix B to Dec. 14, 2018 Defendants' Preliminary Proposed Constructions and Identification of Extrinsic Evidence [Patent Rule 4-2], identifying specific publications from the named inventors.

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			International Telecommunication Union, Final Acts WRC – 2000 ITU Recommendation ITU-R M.1036-2. World Radiocommunication Conference 2000 Resolution 224 International Telecommunication Union Final Acts of the World Administrative Radio Conference for Dealing with Frequency Allocations in Certain Parts of the Spectrum (WARC-92) Statements of Hammett & Edison, Inc., Consulting Engineers (acting as agents on behalf of Verizon, Sprint, and AT&T) Warren Stutzman and Gary Thiele, Antenna Theory and Design (2d. ed.1998) at App'x A		

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			Constantine A. Balanis, Antenna Theory, Analysis and Design (2d. ed. 1997) at App'x IX Constantine A. Balanis, Antenna Theory, Analysis and Design (3d. ed. 2005) at App'x IX Zhijun Zhang, Antenna Design for Mobile Devices (1st ed. 2011) at 15–17 Zhi Ning Chen and Kwai-Man Luk, Antennas for Base Stations in Wireless Communications (2009) at Introduction, chapter 2, chapter 3, and chapter 6 (all excerpts)		
10a	Situated around '918 patent: 12, 14, 15, 19, 24 '768 patent: 3, 5, 6, 13, 16, 24, 25, 26, 27, 33, 35, 36, 39, 41, 42 '870 patent: 3, 7, 8, 9, 13, 16, 17, 18, 22, 24, 25, 27, 35, 36, 37 '256 patent: 13, 14, 15	No construction is necessary. If this term needs a construction, it should be afforded its plain and ordinary meaning, which is "includes."	**Intrinsic Evidence:** 1:14-19, 5:17-45, 6:3-7, 6:35-65, 7:21-25, 7:53-62, 8:35-41, Figs. 2, 3 & 8 **Extrinsic Evidence:** Random House Unabridged Dictionary (1993) (definition of around)	Indefinite	'191 Patent, Col. 3:53-57, 3:64-67, 6:8-14, 7:32-41, Fig. 8, Fig. 10

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	’493 patent: 1		The International Webster’s Compact Dictionary of the English Language (1999) (definition of around) The Oxford American Dictionary and Language Guide (1999) (definition of around) Dr. Stuart Long’s expert declaration in support of Fractus’s claim constructions.		
10b	wherein the working frequency bands are situated around 900 MHz and 1800 MHz ’918 patent: 12	No construction is necessary after construction of “situated around” and “frequency band.” If construction is needed, the term should be afforded its plain and ordinary meaning, which is, “wherein the working [frequency bands] include 900 MHz and 1800 MHz.”	**Intrinsic Evidence:** *See* Fractus’s evidence for “frequency band” with respect to the Interlaced Multiband Array patent family as well as “situated around.” **Extrinsic Evidence:** *See* Fractus’s evidence for “frequency band” with respect to the Interlaced Multiband Array patent family as well as “situated around.” Dr. Stuart Long’s expert declaration in support of Fractus’s claim constructions.	Indefinite	’191 Patent, Col. 3:53-57, 3:64-67, 6:8-14, 7:32-41, Fig. 8, Fig. 10

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10c	wherein the working frequency bands are situated around 900 MHz, 1800 MHz, and 2100 MHz ’918 patent: 14	No construction is necessary after construction of “situated around” and “frequency band.” If construction is needed, the term should be afforded its plain and ordinary meaning, which is, “wherein the working [frequency bands] include 900 MHz, 1800 MHz and 2100 MHz.”	**Intrinsic Evidence:** *See* Fractus’s evidence for “frequency band” with respect to the Interlaced Multiband Array patent family as well as “situated around.” **Extrinsic Evidence:** *See* Fractus’s evidence for “frequency band” with respect to the Interlaced Multiband Array patent family as well as “situated around.” Dr. Stuart Long’s expert declaration in support of Fractus’s claim constructions.	Indefinite	’191 Patent, Col. 3:53-57, 3:64-67, 6:8-14, 7:32-41, Fig. 8, Fig. 10
10d	wherein at least one of the plurality of working frequency bands is situated around 1900 MHz ’768 patent: 13	No construction is necessary after construction of “situated around” and “frequency band.” If construction is needed, the term should be afforded its plain and ordinary meaning, which is, “wherein at least one of the plurality of working [frequency	**Intrinsic Evidence:** *See* Fractus’s evidence for “frequency band” with respect to the Interlaced Multiband Array patent family as well as “situated around.” **Extrinsic Evidence:** *See* Fractus’s evidence for “frequency band” with respect to the	Indefinite	’191 Patent, Col. 3:53-57, 3:64-67, 6:8-14, 7:32-41, Fig. 8, Fig. 10

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		bands] includes1900 MHz."	Interlaced Multiband Array patent family as well as "situated around." Dr. Stuart Long's expert declaration in support of Fractus's claim constructions.		
10e	an operating frequency of the first continuous frequency range is situated around 900 MHz and an operating frequency of the second continuous frequency range is situated around 1800 MHz '493 patent: 1	No construction is necessary after "situated around" and "frequency band" are construed. If construction is needed, this term should be afforded its plain and ordinary meaning, which is, "an operating frequency of the first continuous frequency range includes 900 MHz and an operating frequency of the second continuous frequency range includes 1800 MHz."	**Intrinsic Evidence:** *See* Fractus's evidence for "frequency band" with respect to the Interlaced Multiband Array patent family as well as "situated around." **Extrinsic Evidence:** *See* Fractus's evidence for "frequency band" with respect to the Interlaced Multiband Array patent family as well as "situated around." Dr. Stuart Long's expert declaration in support of Fractus's claim constructions.	Indefinite	'191 Patent, Col. 3:53-57, 3:64-67, 6:8-14, 7:32-41, Fig. 8, Fig. 10
11a	wherein the plurality of working frequency bands of the interlaced multiband antenna array	No construction is necessary after "multiband antenna array," "frequency band,"	**Intrinsic Evidence:** *See* Fractus's evidence for "multiband antenna array" and "frequency	Indefinite	'191 Patent, Figure 5, Col. 3:39-43, 6:66-7:25

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	do not correspond to an integer divider of a highest frequency band ’768 patent: 9	and “integer divider” are construed. If construction is needed, this term should be afforded its plain and ordinary meaning.	band” with respect to the Interlaced Multiband Array patent family. **Extrinsic Evidence:** *See* Fractus’s evidence for “multiband antenna array” and “frequency band” with respect to the Interlaced Multiband Array patent family. Dr. Stuart Long’s expert declaration in support of Fractus’s claim constructions.		
11b	wherein a central frequency of at least one of the plurality of working frequency bands does not correspond to an integer divider of a greater central frequency of the plurality of working frequency bands ’768 patent: 14	No construction is necessary after “multiband antenna array,” “frequency band,” and “integer divider” are construed. If construction is needed, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** *See* Fractus’s evidence for “multiband antenna array” and “frequency band” with respect to the Interlaced Multiband Array patent family. **Extrinsic Evidence:** *See* Fractus’s evidence for “multiband antenna array” and “frequency band” with respect to the Interlaced Multiband Array patent family. Dr. Stuart Long’s expert declaration in support of	Indefinite	’191 Patent, Figure 5, Col. 3:39-43, 6:66-7:25

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			Fractus's claim constructions.		
12a	at least one mono-band antenna element of one of the plurality of mono-band antenna arrays operating at a first working frequency band of the plurality of working frequency bands is repositioned to coincide with a nearest mono-band antenna element of another one of the plurality of mono-band antenna arrays operating at a second working frequency band of the plurality of working frequency bands '768 patent: 17, 31	No construction is necessary after "frequency band," "repositioned" and "mono-band antenna element" are construed. If construction is needed, this term should be afforded its plain and ordinary meaning, "at least one [mono-band antenna element] of one of the plurality of mono-band antenna arrays operating at a first working [frequency band] of the plurality of working [frequency bands] is [repositioned] to coincide with a nearest [mono-band antenna element] of another one of the plurality of mono-band antenna arrays operating at a second working [frequency band] of the plurality of working [frequency bands].	**Intrinsic Evidence:** *See* Fractus's evidence for "mono-band antenna array" and "frequency band" with respect to the Interlaced Multiband Array patent family. **Extrinsic Evidence:** *See* Fractus's evidence for "mono-band antenna array" and "frequency band" with respect to the Interlaced Multiband Array patent family. Dr. Stuart Long's expert declaration in support of Fractus's claim constructions.	Indefinite	'191 Patent, Figure 5, Col 3:39-42, 6:66-7:25, 7:43-67

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12b	at least one mono-band antenna element of one of the plurality of mono-band antenna arrays operating at said first working frequency band is repositioned to coincide with a nearest mono-band antenna element of another one of the plurality of mono-band antenna arrays operating at said second working frequency band '870 patent: 1	No construction is necessary after construction of "respositioned," "frequency band," and "monoband antenna array" (and "monoband antenna array may not even need construction). If construction is needed, this term should be afforded its plain and ordinary meaning, "at least one [mono-band antenna element] of one of the plurality of mono-band antenna arrays operating at a first working [frequency band] is [repositioned] to coincide with a nearest [mono-band antenna element] of another one of the plurality of mono-band antenna arrays operating at a second working [frequency band]."	**Intrinsic Evidence:** *See* Fractus's evidence for "mono-band antenna array," "juxtaposition," and "frequency band" with respect to the Interlaced Multiband Array patent family. **Extrinsic Evidence:** *See* Fractus's evidence for "mono-band antenna array," "juxtaposition," and "frequency band" with respect to the Interlaced Multiband Array patent family. Dr. Stuart Long's expert declaration in support of Fractus's claim constructions.	Indefinite	'191 Patent, Figure 5, Col 3:39-42, 6:66-7:25, 7:43-67
12c	at least one first-band antenna element of the first antenna array is repositioned to coincide with a nearest second-	No construction is necessary after construction of "repositioned,"	**Intrinsic Evidence:** *See* Fractus's evidence for "juxtaposition" and "frequency band" with respect to the Interlaced	Indefinite	'191 Patent, Figure 5, Col 3:39-42, 6:66-7:25, 7:43-67

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

	band antenna element of the second antenna array '256 patent: 11	"frequency band," and "monoband antenna array" (and "monoband antenna array may not even need construction). If construction is needed, this term should be afforded its plain and ordinary meaning, " at least one first-band [antenna element] of the first antenna array is [repositioned] to coincide with a nearest second-band [antenna element] of the second antenna array."	Multiband Array patent family. **Extrinsic Evidence:** *See* Fractus's evidence for "juxtaposition" and "frequency band" with respect to the Interlaced Multiband Array patent family.		
13a	radiation and impedance patterns that are similar in a plurality of the plurality of working frequency bands '768 patent: 1, 9, 16, 23, 30, 38	No construction is necessary. If construction is needed, this term should be afforded its plain and ordinary meaning. A "radiation pattern" is "a graphical representation of the radiation properties of an antenna." "Impedance" is a "ratio between the voltage and currents at the antenna feeding point."	**Intrinsic Evidence:** 1:8-18, 2:32-39, 2:58-3:10, 5:10-15, 5:46-53, 7:43-67, 8:15-28, 9:29-55, 10:5-19, Figs. 7, 8, 11 & 12 '768 Patent File History, Response (Oct. 20, 2008) '870 Patent File History, Response (Nov. 2, 2010) '493 Patent File History, Office Action (Mar. 23, 2013), Response (Aug. 26, 2013)	Indefinite	'191 Patent, Col. 2:8-31, 2:32-54, 5:17-45

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

			Extrinsic Evidence: Constantine A. Balanis, Antenna Theory, Analysis and Design (2d. ed. 1997) at 28, 73–77 Constantine A. Balanis, Antenna Theory, Analysis and Design (3d. ed. 2005) at 27–30, 80–85 Warren Stutzman and Gary Thiele, Antenna Theory and Design (2d. ed.1998) at 24, 43 Zhi Ning Chen and Kwai-Man Luk, Antennas for Base Stations in Wireless Communications (2009) at 2–5. Dr. Stuart Long's declaration in support of Fractus's claim constructions.		
13b	radiation and impedance patterns that are substantially similar in a plurality of the plurality of working frequency bands '870 patent: 1, 11, 20, 29	No construction is necessary. If construction is needed, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** *See* Fractus's evidence for " radiation and impedance patterns that are similar in a plurality of the plurality of working frequency bands"	Indefinite	'191 Patent, Col. 2:8-31, 2:32-54, 5:17-45

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

		A "radiation pattern" is "a graphical representation of the radiation properties of an antenna." "Impedance" is a "ratio between the voltage and currents at the antenna feeding point."	**Extrinsic Evidence:** *See* Fractus's evidence for " radiation and impedance patterns that are similar in a plurality of the plurality of working frequency bands"		
14a	mono-band array '191 patent: 1, 5	"antenna array that covers only one frequency band"	**Intrinsic Evidence:** Abstract, 1:14-19, 1:59-63, 2:62-3:6, 5:1-24, 5:51-53, 5:58-66, 6:3-7, 6:20-23, 6:44-47, 829-50, Fig. 3	"*antenna array* that is useable at only one *frequency band*"	'191 Patent, Col 2:58-3:10, 7:43-67 Fractus v. ZTE, No. 2:17-cv-561, D.E. 71, 77, 85. Fractus v. Samsung, D.E. 475, 526, 900. U.S. Patent No. 8,354,972 THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 458 (7th ed.: 2000) THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 47, 431 (6th ed.: 1993) IEEE Standard Definitions of Terms for Antennas at 5 (1993)

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

					R.F. Graf, MODERN DICTIONARY OF ELECTRONICS p. 85, 304, 458, 488 (7th ed.: 1999) MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS p. 854 (6th ed.: 2003). HARGRAVE'S COMMUNICATIONS DICTIONARY p. 221 (2001) A. W. Rudge, K. Milne, A. D. Olver, and P. Knight (eds.), "Handbook of Antenna Design, Volumes 1 and 2," London, Peter Peregrinus Ltd., 1986, p. 1548. NAMED INVENTOR PUBLICATIONS US Pat. 6,937,206 US Pat. 7,312,762 US Pat. 7,315,289 US Pat. 7,411,556

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

					U.S. Pat. 5,453,751 U.S. Pat. 5,534,877 Prosecution history for 95/000,586. Prosecution history for WO 01/31747 and EP1227545.
14b	mono-band antenna array '768 patent: 1, 8, 9, 16, 17, 23, 30, 31, 38 '870 patent: 1, 4, 11, 20, 29	"antenna array that covers only one frequency band"	**Intrinsic Evidence:** *See* Fractus's evidence for "mono-band array."	"*antenna array* that is useable at only one *frequency band*"	'191 Patent, Col 2:58-3:10, 7:43-67 Fractus v. ZTE, No. 2:17-cv-561, D.E. 71, 77, 85. Fractus v. Samsung, D.E. 475, 526, 900. U.S. Patent No. 8,354,972 THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 458 (7th ed.: 2000) THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 47, 431 (6th ed.: 1993) IEEE Standard Definitions of Terms for Antennas at 5 (1993)

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

					R.F. Graf, MODERN DICTIONARY OF ELECTRONICS p. 85, 304, 458, 488 (7th ed.: 1999) MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS p. 854 (6th ed.: 2003). HARGRAVE'S COMMUNICATIONS DICTIONARY p. 221 (2001) A. W. Rudge, K. Milne, A. D. Olver, and P. Knight (eds.), "Handbook of Antenna Design, Volumes 1 and 2," London, Peter Peregrinus Ltd., 1986, p. 1548. NAMED INVENTOR PUBLICATIONS US Pat. 6,937,206 US Pat. 7,312,762 US Pat. 7,315,289 US Pat. 7,411,556

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

					U.S. Pat. 5,453,751 U.S. Pat. 5,534,877 Prosecution history for 95/000,586. Prosecution history for WO 01/31747 and EP1227545.
15a	mono-band antenna element '768 patent: 1, 8, 9, 16, 17, 23, 30, 31, 38 '870 patent: 1, 4, 11, 20, 29	"antenna element that that covers only one frequency band"	**Intrinsic Evidence:** Abstract, 1:14-19, 1:56-66, 2:66-3:3, 4:1-7, 5:8-16, 5:35-45, 6:20-33, 6:44-47, 8:29-50, 10:15-19, Figs. 3 & 11	"*antenna element* that is useable at only one *frequency band*"	'191 Patent, Col. 2:58-3:10, 4:1-7, 4:21-34, 4:47-56, 5:16-45, 8:1-10, 8:61-9:8, 9:56-65, 3:1-2, 7:25-30, 7:45-67, 8:30-50, 2:32-55, 2:57-3:10, 3:64-67, 5:1-55, 6:16-39, 10:10-19, Figs. 7-12 Fractus Nov. 2, 2004, EPO Response Letter Fractus Nov. 20, 2006, EPO Response Letter Fractus Aug. 8, 2008, EPO Written Submissions and Requested Amendments Fractus Oct. 31, 2008, EPO Letter re Minutes of Oral Proceeding Fractus Feb. 19, 2009, EPO Appeal Reasoning

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

					Fractus Oct. 11, 2012, EPO Letter re Amendments '191 File History, 7/9/2004 Applicant Arguments/Remarks '918 File History, 5/31/2006 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks '870 File History, 11/2/2010 Applicant Arguments/Remarks '493 File History, 8/26/2013 Amendment *See* evidence cited regarding "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*."
15b	mono-band element '768 patent: 38	"element that covers only one frequency band"	**Intrinsic Evidence:** *See* Fractus's evidence for "mono-band antenna element."	"*antenna element* that is useable at only one *frequency band*"	'191 Patent, Col. 2:58-3:10, 4:1-7, 4:21-34, 4:47-56, 5:16-45, 8:1-10, 8:61-9:8, 9:56-65, 3:1-2, 7:25-30, 7:45-67, 8:30-50, 2:32-55, 2:57-3:10, 3:64-67, 5:1-55, 6:16-39, 10:10-19, Figs. 7-12

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

					Fractus Nov. 2, 2004, EPO Response Letter Fractus Nov. 20, 2006, EPO Response Letter Fractus Aug. 8, 2008, EPO Written Submissions and Requested Amendments Fractus Oct. 31, 2008, EPO Letter re Minutes of Oral Proceeding Fractus Feb. 19, 2009, EPO Appeal Reasoning Fractus Oct. 11, 2012, EPO Letter re Amendments '191 File History, 7/9/2004 Applicant Arguments/Remarks '918 File History, 5/31/2006 Applicant Arguments/Remarks '768 File History, 10/20/2008 Applicant Arguments/Remarks

A. MULTIBAND INTERLACED ANTENNA PATENT FAMILY

					'870 File History, 11/2/2010 Applicant Arguments/Remarks '493 File History, 8/26/2013 Amendment *See* evidence cited regarding "*antenna element*," "*mono-band antenna arrays*," and "*frequency band*."
16	Distribution network '870 patent: 29 '493 patent: 18	"the circuitry between the input/output connector and the antenna elements excited by that input/output connector"	**Intrinsic Evidence:** 3:7-10, 5:35-41, 8:1-10 **Extrinsic Evidence:** Warren Stutzman and Gary Thiele, Antenna Theory and Design (2d. ed.1998) at 133–35 Constantine A. Balanis, Antenna Theory, Analysis and Design (2d. ed. 1997) at 772–74 Constantine A. Balanis, Antenna Theory, Analysis and Design (3d. ed. 2005) at 865–66	"the circuitry between the input/output port and the *antenna elements* excited by that input/output port"	'191 Patent, Col. 2:58-3:10, 5:35-45, 8:1-14, 8:61-9:7, 8:56-65, 9:56-10:3 U.S. Patent No. 6,937,206 THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 14 (6th ed.: 1993)

B. SLIM TRIPLE BAND PATENT FAMILY

B. SLIM TRIPLE BAND PATENT FAMILY

No.	Proposed Claim Terms / Patent	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
17	Preferably '814 patent: 2, 9, 19	"Preferably"; "is preferably" and "preferably is" should each be construed as "is."	**Intrinsic Evidence:** '814 patent 3:38-44, 4:25-34, 4:45-49, 5:1-7, 5:23-27, 6:8-13, 7:29-32, 8:1-2, 8:33-37, 9:3-8, 22:27-37 **Extrinsic Evidence:** Dr. Stuart Long's declaration in support of Fractus's claim constructions.	Indefinite	'814 Patent, Col. 3:33-62, 5:1-7, 6:8-14, 7:49-60, 16:52-17:6, 18:35-48, Fig. 2, Fig. 3, Fig. 6a

B. SLIM TRIPLE BAND PATENT FAMILY

18	Frequency band '814 patent: 1, 4, 17, 18, 19 '305 patent: 1, 12	As specifically used in the Slim Triple Band patent family, "frequency band" should be construed as "a range of radio frequencies designated for one or more cellular services."	**Intrinsic Evidence:** '814 patent Abstract, 1:37-43, 3:33-4:9, 17:54-63	"range of frequencies extending between two limiting frequencies"	'814 Patent, Col. 3:33-62, 63-4:9, 5:1-7, 6:29-39, 7:49-67 '191 Patent, Abstract, Col. 4:35-56, 7:32-41, 5:1-3, 4:35-56 Fractus v. ZTE, No. 2:17-cv-561, D.E. 71, 77, 85. Fractus v. Samsung, D.E. 475, 526, 900. U.S. Patent No. 8,354,972 U.S. Patent No. 6,937,206 U.S. Patent No. 7,312,762 U.S. Patent No. 7,315,289 U.S. Patent No. 7,411,556 A. W. Rudge, K. Milne, A. D. Olver, and P. Knight (eds.), "Handbook of Antenna Design, Volumes 1 and 2," London, Peter Peregrinus Ltd. p. 1548 (1986). THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 458 (7th ed.: 2000)

B. SLIM TRIPLE BAND PATENT FAMILY

No.	Proposed Claim Terms / Patent	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
					THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 431 (6th ed.: 1996) R.F. Graf, MODERN DICTIONARY OF ELECTRONICS p. 304 (7th ed.: 1999) MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS p. 854 (6th ed.: 2003) HARGRAVE'S COMMUNICATIONS DICTIONARY p. 221 (2001) NAMED INVENTOR PUBLICATIONS

B. SLIM TRIPLE BAND PATENT FAMILY

19	radiating element '814 patent: 1, 5, 6, 9, 19 '305 patent: 1, 3, 6, 7, 8, 11, 12, 13, 15, 18	No construction necessary. If construction is needed, this term should be construed as "element that radiates and/or receives radio waves."	**Intrinsic Evidence:** '814 patent 4:11-38, 6:29-39, 7:49-8:30, 10:9-21 **Extrinsic Evidence:** Constantine A. Balanis, Antenna Theory, Analysis and Design (1st. ed. 1982) at 1. Warren Stutzman and Gary Thiele, Antenna Theory and Design (1st. ed.1981) at 1.	"individual antenna that makes up an antenna array and that can independently radiate and receive electromagnetic waves"	'814 Patent, Col. 6:49-64, 4:14-25, 5:8-22, Fig. 1 Fractus v. Samsung, D.E. 475, 526, 900. THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 910, 911 (7th ed.: 2000) IEEE STANDARD DEFINITIONS OF TERMS FOR ANTENNAS at 4, 28-29 (1993) R.F. Graf, MODERN DICTIONARY OF ELECTRONICS p. 614 (7th ed.: 1999) MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS p. 709, 1730 (6th ed.: 2003) C. Balanis, ANTENNA THEORY AND DESIGN p. 21-22, 249-250 (2d ed.: 1997) HARGRAVE'S COMMUNICATIONS

B. SLIM TRIPLE BAND PATENT FAMILY

No.	Proposed Claim Terms / Patent	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
					DICTIONARY p. 23 (2001) U.S. Patent No. 6,937,206. Prosecution history for 95/000,586. Prosecution history for WO 01/31747 and EP1227545.
20	"wherein some radiating elements from the first [second] set of the radiating elements operating at only said first [second] frequency band" '814: 1	"wherein some radiating elements from the first [second] set of the radiating elements operate at only said first [second] frequency band"	**Intrinsic Evidence:** '814 patent abstract, 4:60-67, 6:29-39, 7:49-60, 15:12-15, 16:52-60, *See also* Fractus's evidence for "frequency band" and "radiating element)" with respect to the Slim Triple Band patent family.	Indefinite	'814 Patent, Fig. 1. 1a, Abstract, Col. 4:14-25, 5:8-22, Col. 2:31-36, 4:45-67, 16:22-31

B. SLIM TRIPLE BAND PATENT FAMILY

21	at least some radiating elements of the first [second] set of radiating elements are interlaced with at least some radiating elements of the third [fourth] set of radiating elements ’814 patent: 1	No construction is required after construction of “radiating element” with respect to the Slim Triple Band patent family. If construction is required, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** *See* Fractus’s evidence for “radiating element(s)” with respect to the Slim Triple Band patent family. **Extrinsic Evidence:** *See* Fractus’s evidence for “radiating element(s)” with respect to the Slim Triple Band patent family.	“at least some *radiating elements* of the first[second] set are not adjacent along a longitudinal axis to any other *radiating element* of the first [second] set, and at least some *radiating elements* of the third [fourth] set are not adjacent along the same axis to any other *radiating elements* of the third [fourth] set”	’814 Patent, Fig. 1. 1a, Abstract, Col. 4:14-25, 5:8-22, Col. 2:31-36, 4:45-67, 16:22-31 '814 File History, 8/17/12 Amendment THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 577 (7th ed.: 2000) THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS p. 543-544 (6th ed.: 1993) R.F. Graf, MODERN DICTIONARY OF ELECTRONICS p. 386, 387 (7th ed.: 1999) MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS p. 1095 (6th ed.: 2003) HARGRAVE’S COMMUNICATIONS DICTIONARY p. 268 (2001)

B. SLIM TRIPLE BAND PATENT FAMILY

No.	Proposed Claim Terms / Patent	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
					Prosecution history for WO 01/31747 and EP1227545.
22a	said first frequency range is preferably within a range of frequencies from approximately 1700 MHz to approximately 2170 MHz '814 patent: 2	No construction is required after construction of "frequency band" and "preferably" with respect to the Slim Triple Band patent family. If construction is required, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** *See* Fractus's evidence for "frequency band" and "preferably" with respect to the Slim Triple Band patent family. **Extrinsic Evidence:** *See* Fractus's evidence for "preferably" with respect to the Slim Triple Band patent family.	Indefinite	'814 Patent, Col. 3:28-44, 5:1-7, 6:29-36, 7:49-60, 16:61-67
22b	said second frequency range is preferably within a range of frequencies from approximately 700 MHz to approximately 1000 MHz '814 patent: 2	No construction is required after construction of "frequency band" and "preferably" with respect to the Slim Triple Band patent family. If construction is required, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** *See* Fractus's evidence for "frequency band" and "preferably" with respect to the Slim Triple Band patent family. **Extrinsic Evidence:** *See* Fractus's evidence for "preferably" with respect to the Slim Triple Band patent family.	Indefinite	'814 Patent, Col. 3:28-44, 5:1-7, 6:29-36, 7:49-60, 16:61-67

B. SLIM TRIPLE BAND PATENT FAMILY

No.	Proposed Claim Terms / Patent	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
22c	a first portion adapted to operate said radiating element at a first frequency band, preferably within a range of frequencies from approximately 1700 MHz to approximately 2170 MHz '814 patent: 2	No construction is required after construction of "frequency band" and "preferably" with respect to the Slim Triple Band patent family. If construction is required, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** *See* Fractus's evidence for "frequency band" and "preferably" with respect to the Slim Triple Band patent family. **Extrinsic Evidence:** *See* Fractus's evidence for "preferably" with respect to the Slim Triple Band patent family.	Indefinite	'814 Patent, Col. 3:28-44, 5:1-7, 6:29-36, 7:49-60, 16:61-67
22d	a second portion adapted to operate said radiating element at a second frequency band, preferably within the range of frequencies from approximately 700 MHz to approximately 1000 MHz '814 patent: 19	No construction is required after construction of "frequency band" and "preferably" with respect to the Slim Triple Band patent family. If construction is required, the term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** *See* Fractus's evidence for "frequency band" and "preferably" with respect to the Slim Triple Band patent family. **Extrinsic Evidence:** *See* Fractus's evidence for "preferably" with respect to the Slim Triple Band patent family.	Indefinite	'814 Patent, Col. 3:28-44, 5:1-7, 6:29-36, 7:49-60, 16:61-67

B. SLIM TRIPLE BAND PATENT FAMILY

No.	Proposed Claim Terms / Patent	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
23	at least the plurality of radiating elements of the first set and at least a plurality of radiating elements of the third set are substantially aligned with respect to a first vertical direction of the ground plane '305 patent: 12	No construction is required after construction of "radiating element" with respect to the Slim Triple Band patent family. If construction is required, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** '814 patent Fig. 1, 5:28-6:28, 12:47-58, 16:32-51 **Extrinsic Evidence:** *See* Fractus's evidence for "radiating element(s)" with respect to the Slim Triple Band patent family. Dr. Stuart Long's declaration in support of Fractus's claim constructions.	Indefinite	'814 Patent, Fig. 1a-1j, Col. 5:28-42, 5:43-65, 16:32-34, 16:35-44
24	a vertical spacing is constant throughout the antenna array, or different for different pairs of radiating elements '814 patent: 9	No construction is necessary. If a construction is needed, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** '814 patent Fig. 1, 5:28-6:28, 12:47-58, 16:32-51	Indefinite	'814 Patent, Col. 5:28-42, 9:16-33
25	wherein the third and fourth set of radiating elements are substantially on a central vertical axis of said antenna array '814 patent: 12	No construction is necessary. If a construction is needed, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** '814 patent Fig. 1, 5:28-6:28, 12:47-58, 16:32-51 **Extrinsic Evidence:** *See* Fractus's evidence for "preferably" and "antenna	Indefinite	'814 Patent, Col. 5:43-6:7, 16:35-44, 18:54-19:2

B. SLIM TRIPLE BAND PATENT FAMILY

No.	Proposed Claim Terms / Patent	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
			array" with respect to the slim triple band family. Dr. Stuart Long's declaration in support of Fractus's claim constructions.		
26	wherein a size of said first [second] portion is less than half wavelength at a highest frequency of said first [second] frequency band '814 patent: 19	No construction is necessary for this term after construction of "frequency band" with respect to the Slim Triple Band patent family. If a construction is needed, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** '814 patent Fig. 1, 4:11-38, 6:29-39, 8:7-27, 26:12-15	Indefinite	'814 Patent, Col. 8:7-27, 12:47-13:6
27	…substantially vertical direction of the ground plane '305 patent: 1, 6, 8, 11	No construction is necessary. If a construction is needed, this term should be afforded its plain and ordinary meaning.	**Intrinsic Evidence:** '814 patent Figs. 1, 6, 20, 5:28-6:28, 6:40-48, 6:65-7:14, 8:13-27, 12:47-58, 15:26-31, 16:32-51 **Extrinsic Evidence:** *See* Fractus's evidence for "radiating element(s)" with respect to the Slim Triple Band patent family.	Indefinite	'815 Patent, Fig. 5b, Col. 12:47-13:6, 17:64-18:17

B. SLIM TRIPLE BAND PATENT FAMILY

No.	Proposed Claim Terms / Patent	Fractus's Proposed Construction	Fractus's Intrinsic & Extrinsic Evidence	Defendants' Proposed Construction	Defendants' Intrinsic & Extrinsic Evidence
			Dr. Stuart Long's declaration in support of Fractus's claim constructions.		